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17







# PUPIL'S GUID.

TO

## PRACTICAL ARITHMETIC

Containing all the rules, which occur in common business.

Calculated upon the method both of  
*Pounds, Shillings, and Pence, and Federal Money.*

FOR THE USE OF SCHOOLS.

By JONATHAN GROUT, JR.


SECOND EDITION.

SUTTON, (Mass.)

Printed by SEWALL GOODRIDGE,  
For ELIJAH BURBANK, WORCESTER.

1809.

DISTRICT OF MASSACHUSETTS DISTRICT,  
TO WIT.

 **BE** it Remembered,  
That on the first day of April  
in the twenty sixth year of the Independence of  
the United States of America, JONATHAN  
GROUT, JUN. of said District, hath deposited  
in this Office the title of a book, the right  
whereof he claims as Author, in the words fol-  
lowing, to wit, "THE PUPIL'S GUIDE TO  
PRACTICAL ARITHMETIC, containing all the  
rules, which occur in common business. Calcul-  
ated upon the method both of Pounds, Shillings  
and Pence, and Federal Money. For the use of  
schools. By JONATHAN GROUT, JUN."

In conformity to the Act of the Congress



P R E F A C E.

**N**OTWITHSTANDING the several arithmetics now in use, it has been suggested that one, containing such rules only, as occur in trade and business, and adapted to the capacities of youth, would be of extensive utility. The price will be so much reduced by the omission of those rules which are unnecessary in common business, that the poor, as well as the rich, may furnish themselves with books; which has been too much neglected in most of our country schools. Those, who wish to make farther advances can peruse more extensive treatises.

THIS is calculated upon the method, both of pounds, shillings and pence, and federal money, because both are in use; but either can be omitted, if thought necessary.

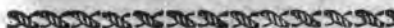
THE author does not presume to offer this as a production entirely original; on the contrary, he acknowledges that he has made many extracts from Bonnycastle's Scholar's Guide, and some from Vyse's Tutor's Guide, and is indebted, for some aid, to a few other authors.

IN pursuing the plan of the work, he has endeavored to make the rules as plain and as concise as possible. Whether it be well executed or not, is not for him to determine. With deference it is

*Submitted to the public, not without a hope  
it will be found, in some degree, useful to our  
schools.*

THE AUTHOR

Worcester, May, 1802.



EXPLANATION of the CHARACT

- $+$  { The sign of addition ; as,  $4+4$  ;  
 { denotes that 4 is to be added to 4  
  
 $-$  { The sign of subtraction ; as,  $8-4$  ;  
 { denotes that 4 is to be taken from



T H E  
PUPILS'S GUIDE, &c.

---

*ARITHMETIC is the art of reckoning by numbers, and is founded on the five following rules, viz. Numeration, Addition, Subtraction, Multiplication, and Division. By the right application of these, all other rules of Arithmetic are wrought.*

---

N U M E R A T I O N.

**N**UMERATION teaches to express any number, composed of these ten characters ; 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. The first nine of these, or rather all of them, are called figures or digits—0 is called nought, or cypher ; and when alone, is of no signification ; but when annexed to the right hand of other figures, it makes the number ten times as much as it was before ; thus, 7, by annexing a cypher, (70) becomes seventy.

When a number of figures are set together, the first, at the right hand, represents its own

## NUMERATION.

value ; that in the second place, ten times its own value ; that in the third place, a hundred times its own value, &c. according to the following table.

<i>Hundreds of mill.</i>	<i>Tens of millions.</i>	<i>Millions.</i>	<i>Hundreds of thous.</i>	<i>Tens of thous.</i>	<i>Thousands.</i>	<i>Hundreds.</i>	<i>Tens.</i>	<i>Units.</i>
9	00	7	6	5	4	3	2	1
	00	7	6	5	4	3	2	1
		7	6	5	4	3	2	1

## NUMERATION.

7

are twenty one ; and the whole period is three hundred and twenty one.

The first figure of the second period is four thousand; the two first, taken together, are fifty four thousand; and the whole period is six hundred and fifty four thousand.

The first figure of the third period is seven millions; the two first are eighty seven millions; and the whole period is nine hundred and eighty seven millions; which, joined to the other two periods, is nine hundred and eighty seven millions, six hundred and fifty four thousand, three hundred and twenty one, 987,654,321.

In like manner, you may enumerate figures which stand in a different order from those in the table. In separating them into periods, you must begin at the right hand, and proceed towards the left; but in expressing their value, you must begin at the left hand, and read towards the right.

A TABLE to enumerate a greater number of figures.

<i>Hund.</i>	<i>of thous.</i>	<i>of bill.</i>
<i>Tens</i>	<i>of thous.</i>	<i>of bill.</i>
<i>Thous.</i>	<i>of billions.</i>	
<i>Hundreds</i>	<i>of billions.</i>	
<i>Tens</i>	<i>of billions.</i>	
<i>Billions.</i>		
<i>Hunds.</i>	<i>of tb.</i>	<i>of mill.</i>
<i>Tens</i>	<i>of thous.</i>	<i>of mil.</i>
<i>Thous.</i>	<i>of millions.</i>	
<i>Hundreds</i>	<i>of millions.</i>	
<i>Tens</i>	<i>of millions.</i>	
<i>Millions.</i>		
<i>Hundreds</i>	<i>of thous.</i>	
<i>Tens</i>	<i>of thousands.</i>	
<i>Thousands.</i>		
<i>Hundreds.</i>		
<i>Tens.</i>		
<i>Units.</i>		



## SIMPLE ADDITION.

*Simple Addition teaches to collect two or more numbers of the same denomination into one sum.*

## R U L E.

1. Place the numbers under each other, so that units may stand under units, tens under tens, hundreds under hundreds, &c. and draw a line underneath.

2. Add up every figure in the column of units, and seek how many tens are contained in their sum; set down what is over exactly under the column added, and carry one for every ten\* to the next column, with which proceed as before, and so on, to the last, at which set down the whole amount.

## P R O O F.

1. Cut off the upper line, and add all the rest together, setting their sum under the number to be proved.

2. Add this amount to the top line, and if the work be right, their sum will be the same as that found by the first addition.

*Or,* Begin at the top and reckon the figures downwards, and if the work be right, this sum will be equal to the first.

---

\* The method of carrying one for every ten from an inferior, to a superior column, is evidently right, because one unit in the latter case is equal to the value of ten units in the former.



## SUBTRACTION.

21

### SUBTRACTION.

*It teaches to find the difference between numbers of the same denomination.*

#### R U L E.

Put the less number under the greater, and stand under units, tens and draw a line underneath. Begin at the right hand, and subtract the lower line from that which is above it. If the lower be lower than the upper, set down the remainder. If the lower figure be greater than that above it, or ten, from which subtract the lower, add ten to the remainder, add the lower figure set down, and carry one to the next figure, for what you borrowed, and proceed as before; and so on, till you come to the end.

#### P R O O F.

Add the remainder to the less number, and the sum will be equal to the greater number.

#### E X A M P L E S.

7	From	7	6	5	4	3	2	1
4	Take	1	2	3	4	5	6	0
—								
3	Rem.	6	4	2	9	7	6	1
—								
7	Proof.	7	6	5	4	3	2	1

*Example, I say 4 from 7 and 3 remain; 2 from 6 and 4 remain; 3 from 5 and 2 remain; 4 from 4 and 0 remain. Thus the sum is 7.*

*Example, I say 0 from 1 and 1 remain; 1 cannot be subtracted from 1, but 6 from 10 and 4 remain.*

## 2 SIMPLE MULTIPLICATION.

remain, and 2, the top figure, make 6, which I set down; then 1 that I carry to 5 is 6, 6 from 10 I cannot, but 6 from 10 and 4 remain, and 3, the top figure, make 7; then 1 that I carry to 4 is 5, 5 from 4, I cannot, but 5 from 10 and 5 remain, and 4, the top figure, make 9; then 1 that I carry to 3 is 4, 4 from 5 and 1 remains; 1 from 6 and 4 remain; 1 from 7 and 6 remain. Thus 6419761 is the remainder, which, added to 1214560, the less given number, make a sum equal to 7654221, the greater given number, which proves the work to be right.

<i>From</i>	1	2	3	4	5
<i>Take</i>			6	7	8
			<hr/>		
<i>Rem.</i>	1	1	6	6	7

<i>From</i>	3	2	1	0	0	0
<i>Take</i>	3	1	0	2	3	4
			<hr/>			
<i>Rem.</i>	1	0	7	6	6	

## T A B L E.

2 times 2 is 4	4 times 4 is 16	7 times 7 is 49
3 6	5 20	8 56
4 8	6 24	9 63
5 10	7 28	10 70
6 12	8 32	11 77
7 14	9 36	12 84
8 16	10 40	8 times 8 is 64
9 18	11 44	9 72
10 20	12 48	10 80
11 22	5 times 5 is 25	11 88
12 24	6 30	12 96
8 times 3 is 9	7 35	9 times 9 is 81
4 12	8 40	10 90
5 15	9 45	11 99
6 18	10 50	12 108
7 21	11 55	10 times 10 is 100
8 24	12 60	11 110
9 27	6 times 6 is 36	12 120
10 30	7 42	11 times 11 is 121
11 33	8 48	12 132
12 36	9 54	12 times 12 is 144
	10 60	
	11 66	
	12 72	

## C A S E I.

*When the multiplier does not exceed 12.*

**RULE. 1.** Place the multiplier under the right hand figure or figures of the multiplicand, and draw a line underneath.

2. Begin with the units, and multiply each figure of the multiplicand singly by the mul-

B

## 14 SIMPLE MULTIPLICATION.

multiplier, setting down what is over ten, or tens, as in addition.

### EXAMPLES.

6 4 2 Multiplicand.  
6 Multiplier.

---

5 8 5 2 Product.

In this example, I say, 6 times 2 is 12; I set down 2 and carry 1 to the next and say 6 times 4 is 24, and 1 that I carry is 25; I set down 5 and carry 2 to the next and say, 6 times 6 is 36 and 2 that I carry are 38, the whole of which I set down, because it is the product of the last figure of the multiplicand.

1 2 3 4 5	5 4 3 2 1	8 5 4 3 2
2	3	4

---

## SIMPLE MULTIPLICATION.

units, tens under tens &c. and draw a line under them.

2. Find the product of the multiplier by each figure of the multiplicand, beginning with the units, and set the first figure of each product exactly under that figure of the multiplier, which you are multiplying by.

3. Add these products together in the same order as they stand, and their sum will be the whole product.

### E X A M P L E S.

Here, I multiply by 4 as in Case first; then I take the second figure of the multiplier, *viz.* 7, and proceed in the same manner, setting the first figure of the product under 7, its multiplier. *Lastly*, I add these products together in the same order as they stand, and the work is done.

$$\begin{array}{r}
 45432 \\
 74 \\
 \hline
 181728 \\
 318024 \\
 \hline
 3361968
 \end{array}$$

$$\begin{array}{r}
 4321 \\
 456 \\
 \hline
 25926 \\
 21605 \\
 17284 \\
 \hline
 1970376
 \end{array}$$

$$\begin{array}{r}
 478321 \\
 7654 \\
 \hline
 1913284 \\
 2391605 \\
 2869926 \\
 3348247 \\
 \hline
 3661068934 \text{ Pro.}
 \end{array}$$

4. Multiply	43206 by 54	Ans.	2333124
5.	9876 — 78		770118
6.	45678 — 87		3973986

multiplier.

1 4 3 2 4	6 7 8 7
4 0 8	3 0 0
1 1 4 5 9 2	6 7 8
5 7 2 9 6	2 0 3 6 2 2
5 8 4 4 1 9 2	2 0 3 6 8 9 8
4 5 6 7 7	1 2 3 4 8
3 4 0 4	1 0 2 8
3 4 0 4	3 0

### CASE IV.

*When there are cyphers on the right hand or both the multiplicand and multiplier.*

**RULE** Omit the cyphers, and find the product of the significant figures, and to the right of the product, annex as many cyphers as there are in both numbers.

### EXAMPLES.

2567

123400

# SIMPLE MULTIPLICATION.

17

*Note.* When the multiplier is an unit with any number of cyphers, annex those cyphers to the right hand of the multiplicand, and the work is done.

Thus, 125 multiplied by 100=12500.

And 456 multiplied by 10000=4560000.

## C A S E V.

*When the multiplier is such a number as can be produced by any two numbers in the Table.*

**RULE.** Multiply the given number by one of those numbers, and that product by the other, and the last product will be the answer.

## E X A M P L E S.

1. Multiply 456 by 25. 2. Mult. 7654 by 56

$$\begin{array}{r} 5 \\ \hline 5 \times 5 = 25 \quad 2280 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 7 \\ \hline 7 \times 8 = 56 \quad 53578 \\ \hline 8 \end{array}$$

11400 Ans.

428624 Ans.

3. Mult. 4747 by 42. 4. Mult. 13245 by 96

## A P P L I C A T I O N.

1. Suppose 47 men took a prize, and each man's share amounted to 466 dollars; what was the value of the prize? Ans. 21902 dols.

2. What sum of money must be divided among 26 men, so that each may receive 124 dollars? Ans. 3224 dols.

3. How many miles will a man travel in 48 days, if he travel, each day, 35 miles?

Ans. 1680 miles.

4. If a man can make 150 tops in one day; how many can he make in 365 days?

Ans. 54750.

1. The Dividend, which is to be divided.
2. The Divisor which is the number
3. The quotient, which is the answer
4. The Remainder,\* which is left over, and sometimes there is none at all.

#### P R O O F.

Multiply the quotient by the divisor, the product, add the remainder, if any, if the work be right, will be the dividend.

### SIMPLE DIVISION

Simple Division teaches to divide one number by another, each of which must be of the same denomination.

#### C A S E I.

When the divisor is not above 12.

**RULE. 1.** Place it at the left

\* When there is no remainder the quotient is the complete and perfect answer, when there is a remainder, it bears

dividend with a curved line between ; then draw a line under the dividend ; thus,

Divisor 6)45625 Dividend.

Quotient.

2. Seek how many times the divisor is contained in just so many of the left hand figures of the dividend as are necessary to contain it, and set the number in the quotient, under the right hand figure of those used in the dividend.

3. Carry the remainder, if any, to the next figure in the dividend, where it must be accounted so many tens ; that is, if 1 remain call it 10 ; if 2 remain, call it 20 ; if 3, 30 ; if 4, 40, &c. to which add the next figure of the dividend, and in which seek how many times the divisor is contained. Thus proceed, carrying the remainder in your mind from one figure to another, till you have gone through the whole.

*Note.* If the remainder, when added to the next figure of the dividend, be less than the divisor, place a cypher in the quotient, and call the units of those figures so many tens, to which add the next figure of the dividend.

### EXAMPLES.

6)45625

7604 $\frac{1}{6}$  Quotient.

In this example, I find that 6, the divisor, cannot be contained in the first figure of the dividend, viz. 4, therefore, I seek how many

many times the divisor is contained in 12, finding it to be 6 times and nothing more; therefore set 6 in the quotient; and because the divisor cannot be contained in the remainder 12 of the dividend, viz. 2, I set down nothing and carry it to the next figure of the dividend, viz. 5, which makes it 25; I then find how many times the divisor is contained in 25, finding it to be 4 times, I set it down 4 in the quotient; and place the one which remains, 9, and place the one which remains, 7, under the divisor, at the end of the quotient, shewing that there is one sixth part of the dividend not divided.

<u>3) 4567</u>	<u>4) 1232</u>	<u>5) 987</u>
<u>15222<math>\frac{1}{3}</math></u> 3	<u>308</u>	<u>197</u>

4567 Proof.

<u>8) 5678</u>	<u>8) 9876</u>	<u>9) 1234</u>
----------------	----------------	----------------

## C A S E II.

*When the divisor exceeds 12.*

**RULE. 1.** Draw a curved line on the right and left of the dividend, and place the divisor on the left hand, and the quotient, as it rises, on the right ; thus,

Dividend.

Divisor 34) 8 9 6 7 ( . . . Quotient.

2. Seek how many times the divisor is contained in just so many of the first figures of the dividend, as are necessary to contain it, and set the number in the quotient.

3. Multiply the divisor by the quotient figure, and place the product under those figures of the dividend, with which you began to work, setting the first figure of the product under the right hand figure of those, used in the dividend.

4. Subtract it from that part of the dividend under which it stands, and to the right hand of the remainder, bring down the next figure of the dividend. Then seek how many times the divisor is contained in those figures, which number when found, set in the quotient at the right hand of the other quotient figure ; multiply the divisor by it, subtract as before, and bring down the next figure of the dividend. Thus, seek, multiply, and subtract, till every figure of the dividend be brought down.

*Note 1.* When you bring down a figure from the dividend, make a dot under it, to signify that it has been brought down.

*Note 2.* When you bring down a figure from the dividend to the remainder, and it is

## SIMPLE DIVISION.

than the divisor, place a cypher in the quotient, and bring down another figure from the dividend.

### *E X A M P L E S.*

Divide 8967 by 34.

The sum stated according to the foregoing rule, will stand thus, 34) 8967( . Secondly, I seek how many times the dividend is contained in the two first figures of the dividend, viz. 89, and finding it to be twice, I set 2 in the quotient, and multiply the dividend by it, saying, twice 4 is 8 which I set under 8, then twice 3 is 6, which I set under 9, and 68 will stand thus,

$$\begin{array}{r} 34 \overline{) 8967} \quad (2 \\ \underline{68} \phantom{00} \end{array}$$

Thirdly, I subtract 68 from 89, and find the remainder of 21; to the right hand of which I bring down the next figure of the dividend,

# SIMPLE DIVISION.

23

Fifthly, I subtract 204 from 216 and find a remainder of 12, to the right hand of which I bring down the next and last figure of the dividend, viz. 7, and the work will appear thus,

$$\begin{array}{r} 34 \overline{) 8967} \text{ (26} \\ 68 \text{ ..} \end{array}$$

$$\begin{array}{r} \hline 216 \\ 204 \\ \hline 127 \end{array}$$

Sixthly, I then seek how many times the divisor is contained in 127, and finding it to be 3 times, I set 3 in the quotient and multiply the divisor by it, saying, 3 times 4 is 12, I set down two and carry 1, saying, 3 times 3 is 9, and 1 that I carry is 10, which I set under 12, and after subtracting as before, I find a remainder of 25, and the work is done, and will appear thus,

$$\begin{array}{r} 34 \overline{) 8967} \text{ (263 Quo.} \\ 68 \text{ ..} \end{array}$$

$$\begin{array}{r} \hline 216 \\ 204 \\ \hline 127 \\ 102 \end{array}$$

25 Rem.

$$\begin{array}{r} 263 \text{ Quotient.} \\ 34 \text{ Divisor.} \end{array}$$

$$\begin{array}{r} \hline 1052 \\ 789 \\ \hline 25 \text{ remain.} \end{array}$$

8967 Proof.

## SIMPLE DIVISION.

$$\begin{array}{r} 91) 896021 \text{ (9739} \\ 828 \end{array}$$

$$\begin{array}{r} \hline 680 \\ 644 \\ \hline \end{array}$$

$$\begin{array}{r} 362 \\ 276 \\ \hline \end{array}$$

$$\begin{array}{r} 861 \\ 818 \\ \hline \end{array}$$

32

$$\begin{array}{r} 334) 7962061 \text{ (34025} \\ 702 \end{array}$$

$$\begin{array}{r} \hline 942 \\ 936 \\ \hline \end{array}$$

$$\begin{array}{r} 606 \\ 468 \\ \hline \end{array}$$

$$\begin{array}{r} 1381 \\ 1170 \\ \hline \end{array}$$

211

4. Divide 47432 by 19. Ans. 2496 $\frac{8}{19}$   
 5. Divide 36850 by 22. Ans. 1675  
 6. Divide 98496 by 456. Ans. 216  
 7. Divide 56789 by 789. Ans. 71 $\frac{719}{789}$

*To prove Division by Addition.*

*Note,* The asterisks shew what lines are to be added to prove the work.

It is sometimes difficult to know how many times the divisor may be had in the numbers of the several steps of the operation. The best way will be to find how many times the first figure of the divisor may be had in the first, or two first figures of the dividend, and that number, made less by one or two, is generally the figure wanted.

If the product of the quotient figure, multiplied by the divisor, be larger than those figures under which they stand, strike out those figures, and put a smaller one in the quotient.

If the remainder, after you have subtracted, be equal to, or larger than the divisor, strike out the figures, and put a larger one in the quotient.

### C A S E III.

When there are cyphers on the right hand of the divisor, cut them off, and the same number of figures from the right hand of the dividend, and proceed as before, and to the right hand of the remainder, annex those figures which were cut off from the dividend.

### E X A M P L E S.

$  \begin{array}{r}  4 \overline{) 7654010} \\  \hline  \text{Quo. } 19135 \\  \hline  3 \overline{) 00076541420} \\  \hline  \text{Quo. } 25513 \text{---} 2410 \text{ Rem. } 4019 \text{ Rem.}  \end{array}  $	$  \begin{array}{r}  76 \overline{) 00437211957} \text{ Quo.} \\  \hline  380 \\  \hline  572 \\  \hline  532 \\  \hline  \hline  \end{array}  $
--	--

## SIMPLE DIVISION.

When the divisor is 10, 100, 1000, &c. Cut off as many figures from the right hand of the dividend, as there are cyphers in the divisor, and the work is done; those figures on the left hand will be the quotient, and those on the right, the remainder.

## E X A M P L E S.

Quo. Rem.	Q. Rem.
$10 \overline{) 76542}$	$100 \overline{) 4560}$

## C A S E IV.

When the divisor is such a number as can be produced by two numbers of the multiplication table, divide by one of those numbers, and that quotient divide by the other, and the last quotient will be the true quotient required.\*

## E X A M P L E S.

## COMPOUND ADDITION.

27

4. A certain man wishes to go a journey of 424 miles in eight days ; how many miles must he travel each day ?      Ans. 53 miles.

## COMPOUND ADDITION

*Is the adding of several numbers of different denominations, as pounds, shillings, pence ; yards, quarters, nails ; tons, hundreds, quarters, pounds, &c.*

**RULE. 1.** Place each denomination exactly under those of the same name ; that is, pounds must be placed under pounds, shillings under shillings, pence under pence, &c.

2. Begin with the least denomination, and find the sum of that column as in simple addition, and divide it by such a number as it takes of that denomination to make one of the next.

3. Set down the remainder under the column added, and carry the quotient to the next column, with which proceed as before, and so on, to the last, in which carry by tens as in simple addition.

## M O N E Y.

gr. 4 Farthings make 1 penny.

d. 12 Pence ——— 1 shilling.

s. 20 Shillings ——— 1 pound. £.

A Guinea	is	28s.		Note $\frac{1}{4}$ is 1 farthing, or
A Pistole		22s.		quarter of any thing,
A Moidore		36s.		$\frac{1}{2}$ is 2 farthings, or half
A half Johannes		48s.		of any thing.
A Johannes		96s.		$\frac{3}{4}$ is 3 farthings, or three
				quarters of any thing.

## COMPOUND ADDITION.

## PENCE TABLE.

pence.	s.	d.	pence.	s.	d.
20 is	1	- - 2.	70 is	5	- - 10
30—	2	- - 6	80—	6	- - 8
40—	3	- - 4	90—	7	- - 6
50—	4	- - 2	100—	8	- - 4
60—	5	- - 0	110—	9	- - 2

## EXAMPLES.

£.	s.	d.	gr.	£.	s.	d.	£.	s.	d.
14	12	7	2.	127	17	9½	14	17	3
17	16	4	0	134	16	7½	16	6	5
19	10	8	2	142	15	3½	12	7	6
27	13	4	3	136	10	4	16	18	7
<hr/>				<hr/>			<hr/>		
79	13	0	3	542	0	0½			
<hr/>				<hr/>			<hr/>		
55	00	5	1	414	2	3			

## COMPOUND ADDITION.

29

row, I call every unit 10, and say 13 and 10 are 23 and 10 are 33 and 10 are 43 and 10 are 53 shillings, which I divide by 10, the number of shillings in a pound, saying, 20's in 53, twice and 13 remain, I set down 13 under the shillings, and carry 2 to the pounds which I add as in simple addition.

The other sums in this and the following rules are wrought in the same manner. The several tables should be gotten well by heart, that you may readily know what number to carry by, in every denomination.

## AVOIRDUPOIS WEIGHT.

By this weight, are weighed butter, cheese, tallow, flax, hemp, hay, silk, wool, bread, meat, all kinds of grocery wares which are subject to waste, and all kinds of metals, except gold and silver.

*dr.* 16 drams make 1 ounce.

*oz.* 16 ounces ——— 1 pound.

*lb.* 28 pounds ——— 1 quarter.

*qr.* 4 quarters ——— 1 hun. weight.

*C* 20 hundred ——— 1 ton. *T.*

<i>T.</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>oz.</i>	<i>dr.</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>oz.</i>
14	12	2	17	14	8	4	1	18	11
17	10	3	14	11	7	7	3	16	14
16	14	1	19	12	4	8	3	17	10
18	10	2	14	10	9	4	1	13	11

*Note.* 175 Troy ounces are precisely equal to 192 Avoirdupois ounces; and 175 Troy pounds are equal to 144 Avoirdupois; one pound Troy is 3750 grains, and 1 lb. Avoirdupois is 7000 grains.

*ss.* 20 penny wt. — 1 ounce,  
 12 ounces — 1 pound

<i>oz.</i>	<i>pwt.</i>	<i>grs.</i>	<i>lb.</i>	<i>oz.</i>	<i>pwt.</i>	<i>grs.</i>	<i>lb.</i>
10	14	13	1	2	8	13	7
11	16	17	3	4	5	16	6
8	15	10	7	5	4	15	4
10	15	20	6	7	4	22	8

## APOTHECARIES' WEIGHT.

By this weight, Apothecaries mix their  
 medicines, but they buy and sell them by  
 avoirdupois weight.

*gr.* 20 grains make 1 scruple

*sc.* 3 scruples - - 1 dram

*dra.* 8 drams - - 1 ounce

*oz.* 12 ounces - - 1 pound

<i>oz.</i>	<i>dra.</i>	<i>sc.</i>	<i>gr.</i>	<i>lb.</i>	<i>oz.</i>	<i>dra.</i>	<i>sc.</i>
10	7	1	14	27	11	4	2

## T I M E.

The solar year, containing 365 days and 6 hrs, is divided into 12 calendar months in following manner.

Thirty days hath September,  
April, June, and November ;  
February, twenty-eight alone,  
And all the rest have thirty-one.

The odd hours, making one day in four rs, are added to February, which has then nty-nine days. The year is then called year.

60 seconds make 1 minute.

60 minutes ——— 1 hour

24 hours ——— 1 day

365 days ——— 1 year Y.

Y.	d.	h.	'	"	Y.	d.	h.	'	"	l.
3	40	16	30	42	1	23	4	56	17	
3	32	14	27	44	2	34	5	16	27	
2	74	19	40	30	3	45	6	17	18	
1	10	15	57	16	4	56	8	18	19	

## CLOTH MEASURE.

4 nails make 1 quarter.

4 quarters ——— 1 yard. yd.

5 quarters ——— 1 Ell English E. E.

6 quarters ——— 1 Ell French E. F.

## DRY MEASURE.

2 pints make 1 quart.

4 quarts 1 gallon

2 gallons, or 8 qts. 1 peck

4 pecks 1 bushel bu.

## COMPOUND ADDITION.

## LONG MEASURE.

<i>bar.</i>	3	barley corns	make	1	inch.
<i>in.</i>	12	inches	-	-	1 foot.
<i>ft.</i>	3	feet	-	-	1 yard.
<i>yd.</i>	5½	yards, or	16½	feet	1 rod.
<i>rod.</i>	40	rods	-	-	1 furlong.
<i>fur.</i>	8	furlongs	-	-	1 mile. <i>M.</i>

## LIQUID MEASURE.

<i>g.</i>	4	gills	make	1	pint.
<i>pt.</i>	2	pints		1	quart.
<i>qt.</i>	4	quarts		1	gallon.
<i>gal.</i>	54	gallons		1	hoghead, beer measure.
	63	gallons		1	hoghead, wine measure.

## APPLICATION.

1. A nobleman is informed by his steward, that his brewer's bill is £8 10; his butcher's

# COMPOUND SUBTRACTION

*Teaches to find the difference between two numbers of different denominations.*

**RULE. 1.** Place the less number below the greater, so that each denomination may stand exactly under that of the same name.

**2.** Begin with the least denomination, and when the lower figures are less than those above them, set down the difference.

**3.** But when the lower figures are larger than those above them, subtract the lower from such a number as it takes of that denomination to make one of the next greater, and to the remainder, add the top figure, and carry one for what you borrowed to the lower figure of the next denomination, which subtract as before, and so on, through the whole.

The method of proof is the same as in simple subtraction.

## MONEY.

	£.	s.	d.	qr.		£.	s.	d.
From	47	14	6	2		95	10	4½
Take	26	12	4	1		17	10	9½
	<hr/>					<hr/>		
Rem.	21	2	2	1		77	19	6½
	<hr/>					<hr/>		

In the first example, all the lower figures are less than those above them, therefore I only set down the differences as in whole numbers.

In the second example, the lower figures are larger than those above them, therefore,

I begin with the farthings and say, 3 from 2 I cannot, but three from 4, the number of farthings in a penny, and 1 remains, and 2 the top figure make 3, which I set down ; then 1 which I borrowed, I carry to 9 which makes it 10, 10 from 4 I cannot, but 10 from 12, the number of pence in a shilling, and 2 remain, and 4 the top figure are 6, which I set down ; then 1 that I carry to 10 is 11, 11 from 10 I cannot, but 11 from 20, the number of shillings in a pound, and 9 remain, and 10 the top figure, are 19, which I set down ; then 1 to 7 is 8, 8 from 5 I cannot, but 8 from 10, (as in whole numbers,) and 2 remain, and 5, the top figure are 7, then 1 to 1 is 2, 2 from 9 and 7 remain, which I set down and the work is done.

£.	s.	d.	£.	s.	d.
From 1240	17	4½	From 14	15	6

# COMPOUND SUBTRACTION. 33

## TROY WEIGHT.

<i>lb. oz. pwt. grs.</i>	<i>lb. oz. pwt. grs.</i>
14 8 15 14	106 11 19 17
12 9 14 17	72 10 19 21
<hr/>	<hr/>

## APOTHECARIES' WEIGHT.

<i>lb. oz. dra. sc. gr.</i>	<i>lb. oz. dra. sc. gr.</i>
17 7 4 2 14	7 2 1 1 12
10 8 5 1 15	4 5 4 2 10
<hr/>	<hr/>

## TIME.

<i>Y. d. h. ' "</i>	<i>D. h. ' "</i>
4 72 14 45 16	107 10 16 14
1 87 13 14 47	77 17 12 10
<hr/>	<hr/>

## APPLICATION.

1. What is the difference between 1 penny and £ 100 ?      Ans. £99 19 11.

2. What is the difference between 1 ton, and 3 C. 2 qr. 27 lb. 8 oz. ?

Ans. 16 C. 1 qr. 0 lb. 8 oz.

3. Bought a silver tankard which weighed 5 lb. when new, but now, it being worn so much that it weighs but 3 lb. 3 oz. 3 pwt. and 3 gr. how much has been worn off ?

Ans. 1 lb. 8 oz. 16 pwt. 21 gr.

4. Jacob by contract was to serve Laban, for his two daughters, 14 years ; and when he had accomplished 11 years, 11 days, 11 hours, 11 minutes, and 11 seconds, how long had he to serve ?      Ans. 2 y. 353 d. 14 h. 48' 49"

## 16 COMPOUND MULTIPLICATION.

5. A man, being 57 years old, has been married 27 years, 37 days, and 6 hours; how old was he when he was married?

Ans. 29 Y. 327 d. 18 h.

6. What is the difference between 1 yard and 1 nail?

Ans. 3 qr. 3 na.

7. What is the difference between 1 barley corn, and 1 mile?

Ans. 7 fur. 39 rod.  $4\frac{1}{2}$  y. 2 ft. 11 in. 2 b.

## COMPOUND MULTIPLICATION.

*Compound multiplication is the multiplying of a number, consisting of several denominations, and is a very useful rule to find the value of goods, when the price is pounds, shillings, and pence.*

### CASE I.

*When the quantity does not exceed 12.*

RULE. Multiply the price by the quantity.

## COMPOUND MULTIPLICATION. 37

is 22, which is £ 1 2s. I set down 2s, and carry 1 and say, 3 times 1 is 3 and 1 I carry is 4, which I set down, and the answer is £ 4 2 6.

In the second example, I say 5 times 7 is 35d; 2s. 11d. I set down 11 and carry 2, saying, 5 times 8 is 40 and 2 are 42, 5 times 1 is 5 and 4 are 9, that is 92s. £ 4 12, I set down 12 and carry 4, saying, 5 times 1 is 5 and 4 are 9.

<i>Questions.</i>				<i>Answers.</i>			
<i>Yds.</i>		<i>£.</i>			<i>£.</i>	<i>s.</i>	<i>d.</i>
3.	4 at	1	10 7½ per yard		6	2	6
4.	6 —	0	18 4	—	5	10	0
5.	7 —	0	4 6	—	1	11	6
6.	8 —	1	3 6	—	9	8	0
7.	9 —	0	9 9½	—	4	8	1½
8.	10 —	0	3 9	—	1	17	6
9.	11 —	1	4 0	—	13	4	0
10.	12 —	0	12 3	—	7	7	0

### C A S E II.

*If the given quantity be above 12. and is such a number as can be produced by any two numbers in the multiplication table.*

**RULE.** Multiply the price by one of those numbers, and that product by the other, and the last product will be the answer.

1. What will 16 yards cost at £ 1 17 4 per yard?

$$\begin{array}{r}
 4 \\
 \hline
 4 \times 4 = 16 \quad 7 \quad 9 \quad 4 \\
 \hline
 \text{Answer } \quad \underline{\underline{£ 29 \quad 17 \quad 4}}
 \end{array}$$

## § COMPOUND MULTIPLICATION.

*Questions.*

*Answers.*

<i>Yds.</i>		<i>£.</i>	<i>s.</i>	<i>d.</i>		<i>£.</i>	<i>s.</i>	<i>d.</i>
24	at	1	11	4 per yd.		37	12	0
25	—	0	12	9	—	15	18	9
28	—	0	5	3	—	7	7	0
36	—	0	1	10½	—	3	7	6
42	—	1	4	0	—	50	8	0
45	—	1	2	6	—	50	12	6
56	—	0	17	6	—	49	0	0
64	—	0	12	6	—	40	0	0

### CASE III.

*When the given quantity, or number, is not to be found in the Table.*

**RULE.** Multiply by two such numbers, as are the nearest to it; then add to, or subtract from, the last product, the price of the odd.

## COMPOUND DIVISION.

<i>Questions.</i>				<i>Answer</i>	
	<i>yards.</i>	<i>s.</i>	<i>d.</i>	<i>£</i>	<i>s.</i>
1.	29 at	14	11 per yd,	21	12
3.	37	13	4	24	13
4.	53	7	6	19	17
5.	62	8	3½	25	14

### EXAMPLES OF WEIGHTS AND MEASURES

<i>T. C. qr. lb. oz. dr.</i>						<i>lb. oz. pwt.</i>		
4	7	2	14	7	9	13	6	12
				7				
<hr/>						<hr/>		
	<i>Y.</i>	<i>d.</i>	<i>h.</i>	<i>'</i>	<i>"</i>	<i>Yard.</i>	<i>qr.</i>	<i>na.</i>
	7	32	4	12	40	146	3	2
					4			12
	<hr/>					<hr/>		

## COMPOUND DIVISION

*Is the dividing of a number, consisting of several denominations.*

**RULE. 1.** Seek how many times the divisor is contained in the left hand denomination, and place the figure in the quotient, under the number divided.

2. Reduce the remainder, if any, to the next denomination, and add to it the number which was in it before, then divide again, and so on through the whole.

<i>£.</i>	<i>s.</i>	<i>d.</i>		<i>£.</i>	<i>s.</i>	<i>d.</i>
4)45	14	7		6)13	6	8
<hr/>				<hr/>		
11	8	7½	<i>Ans.</i>	£2	4	5½
<hr/>				<hr/>		

In the first example, I say the 4's in 4, once, which I set down; then the 4's in 5, once,

## COMPOUND DIVISION.

which I also set down, and the 1 which remains is £ 1, or 20s. which with the 14 in the place of shillings are 34s.; then the 4's in 34, 8 times, which I set under the shillings, and the 2 which remain are 2s or 24d. and 7 in the place of pence make 31d; then the 4's in 31, 7 times, which I set down, and the 3 which remain are 3d. or 12qr.; then the 4's in 12, 3 times, which I set down, and the work is done.

If the divisor exceed 12, and is such a number as can be produced by any two numbers of the table, divide the given dividend by one of those numbers, and this quotient by the other, and the last quotient will be the answer.

Divide £ 114 17 6 by 24

	£.	s.	d.
6)	114	17	6
	<hr/>		
4)	10	2	11

# COMPOUND DIVISION.

4.

## EXAMPLES OF MONEY.

	£.	s.	d.		Answer.	£.	s.	d.
1. Divide	47	16	8½	by 6		7	19	5
2. —	134	19	7	— 7		19	5	7
3. —	654	13	0	— 10		65	9	3
4. —	147	10	8½	— 27		5	9	3
5. —	39	16	4	— 31		1	5	8
6. —	107	17	5	— 64		1	13	8
7. —	77	17	8	— 75		1	0	9

A gentleman died, leaving £481 19s, of which the widow was to receive one third part and the remainder was to be equally divided among 6 children ; what was each child's portion ?

£	s.	
160	13	widow's portion,
53	11	each child's portion.

Divide £1868 between a man and a boy so that the man will have twice as much as the boy.

£	s.	d.	
1245	6		8 man's part,
622	13		4 boy's part.

Divide £998 among a widow and her four children so that the widow may have one third part and the oldest child a double portion.

£	s.	d.	
332	13		4 widow's portion,
266	2		8 double portion,
133	1		4 single portion.

D 2

## REDUCTION.

*EXAMPLES OF WEIGHTS AND MEASURES.*

T. C. qr. lb. oz.	Y. d h. ' "
7) 7 12 1 16 6	6) 4 13 16 17 16

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Yds. qr. n.

9) 14 3 1

---

EE. qr. n.

8) 77 3 3

---

---

---

lb. oz. pwt. gr.

6) 7 8 9 7

---

---

**PROOF.** Divide the last product by the last multiplier, and that quotient by the next multiplier, &c. If the work be right, the last quotient will be equal to the first multiplicand.

*E X A M P L E S.*

1. In £, 12, how many farthings?

$$\begin{array}{r}
 20 \text{ shillings in a pound. } 4)11520 \\
 \hline
 240 \\
 12 \text{ pence in a shilling. } 12)2880 \\
 \hline
 2880 \\
 4 \text{ farthings in a penny. } 2|0)2880 \\
 \hline
 \text{£. 12 Proof.}
 \end{array}$$

*Ans.* 11520 farthings.

*Note.* When the number to be reduced has several denominations, add the less denominations to the former product, or bring them in as you multiply.

$$\begin{array}{r}
 \text{£. s. d.} \\
 2. \text{ In } 47 \text{ } 14 \text{ } 6. \text{ how many pence?} \\
 20 \\
 \hline
 954 \text{ shillings in } 47 \text{ } 14. \\
 12
 \end{array}$$

$$\begin{array}{r}
 \text{£. s. d.} \\
 \text{Ans. } 11454 \text{ pence in } 47 \text{ } 14 \text{ } 6
 \end{array}$$

3. In £ 147 16s 7½d, how many shillings, pence, and farthings?

*Ans.* 2956s, 35479d. 141918qr.

4. Reduce £ 16 17s. 8d. to pence. *Ans.* 4052

5. Reduce £ 172 12s. to farthings. 165696qr.

6. Reduce 49 guineas to shillings. 1372s.

7. Reduce 14 pistoles to pence 3696d.

8. Reduce 40 dollars to pence. 2880d.

## REDUCTION.

## AVOIRDUPOIS WEIGHT.

1. In 7 C. 3 qr. 14 lb. how many pounds  
4 quarters in a Cwt

$  \begin{array}{r}  31 \\  28 \text{ lbs. in a quarter.} \\  \hline  262 \\  62 \\  \hline  882 \text{ lbs. Ans.}  \end{array}  $	<div style="text-align: center;">Proof.</div> $  \begin{array}{r}  (4) \\  28 \overline{) 882} (31 \\  \underline{84} \phantom{00} \\  42 \phantom{00} \\  \underline{28} \phantom{00} \\  14  \end{array}  $
--	---

T. C. qr. lb.

- |                                |             |
|--------------------------------|-------------|
| 2. Reduce 3 14 3 9 to pounds.  | Answer 8381 |
| 3. Reduce 4 15 1 12 to ounces. | 170880      |
| 4. Reduce 1 11 2 7 to drams.   | 904960      |

## TROY WEIGHT.

lb. oz. pwt. gr.

Answer

## 45

**1. How many barley corns are in 12 miles?**

**Ans.** 2280960.

2. Reduce 47 miles, 4 fur. 14 rods to inches.

**Ans.** 3012372

3. In 100 miles how many rods, yards, feet, inches, and barley corns?

Answer 31000 rods. 176000 yards. 528000 feet. 6336000 inches. 19008000 barley-corns.

**RULE.** Divide the given denomination by such a number of that name, as make one of the next greater, and this quotient again by such a number as make one of the next, and so on, till it is brought as high as the question requires, and the last quotient, with the several remainders, will be the answer.

1. In 1520 farthings, how many pounds?

4) 11520

12) 2880

210) 2410

f. 12 Answer.

2. In 11454 pence how many pounds?

12) 11454

210) 9514 6d

**£. 47 14s. 6d. Answer.**

## REDUCTION.

Answers.

3. Red. 141918 farthings to pounds. 147 16 7½  
 4. — 4052 pence to pounds. 16 17 8  
 5. — 165696 farthings to pounds 172 12  
 6. — 1372 shillings to guineas. 49 guineas  
 7. — 3696 pence to pistoles. 14 pistoles.  
 8. — 2880 pence to dollars. 40 dollars.  
 9. — 186 pence to shillings. 15/6

AVOIRDUPOIS WEIGHT. Answer.

T. C. qr. lb.

1. Red. 882lbs. to hundreds, &c. 8 7 3 14  
 2. — 8381lbs. to tons, &c. 3 14 3 9  
 3. — 170880 oz. to tons &c. 4 15 1 12  
 4. — 904960 dr. to tons, &c. 1 11 2 7

TROY WEIGHT. lb. oz. pwt. gr.

1. Red. 31262 gr. to pounds &c. 5 6 7 14  
 2. — 1066 pwts. to pounds. 4 9 6 0  
 3. — 688 oz. to pounds. 57 4 0 0

TIME.

- \* Red. 258412000 seconds to years.

## FEDERAL MONEY.

The method of reckoning in federal money is the most simple and easy of any coin whatever ; and by its proceeding in a tenfold proportion, it is added, subtracted, multiplied, and divided, like numbers of one denomination.

## MARKED.

m.		10 mills make	1 cent.
ct.		10 cents	= 1 dime.
d.		10 dimes	= 1 dollar.
D.		10 dolls.	= 1 eagle.      E.

Eagles and dimes are seldom repeated in expressing sums in this rule ; for to say 99 dollars, 76 cents, and 5 mills will express the value of the sum as plainly, and with fewer words than to say 9 eagles, 8 dollars, 7 dimes, 6 cents and 5 mills.

## REDUCTION.

To reduce dollars to cents, annex two cyphers at the right hand of the dollars ; and to reduce dollars to mills, annex three cyphers, and the work is done.

Thus, 476 dollars = 47600 cents = 476000 mills.

When the sum consists of dollars and cents, exhibit the particular number of cents contained in it. And likewise, dollars, cents, and mills, exhibit the particular number of mills.

D.    ct.    m.

Thus 45    67    8 = 45678 mills.

And    34    56    = 3456 cents.

## FEDERAL MONEY.

reduce cents to dollars, separate the two hand figures of the cents, and the work is  
Those figures on the left hand are dollars and those on the right are cents.

D. ct.

Thus 5785 cents = 57 85

To reduce mills to dollars, separate the right hand figure for mills, the two next for cents, and the rest will be dollars.

D. cts. m.

Thus 65532 mills = 65 53 2

## ADDITION.

*Note.* When the cents are expressed by a single figure, a cypher must always be prefixed to the left hand.

EXAMPLES.

D. cts.

## FEDERAL MONEY.

49

### MULTIPLICATION.

Multiply as in whole numbers, and point off so many places for cents and mills as there are places of cents and mills in the given price.

#### E X A M P L E S.

What cost 21 acres of land at 14 dollars, and 55 cents per acre?      What will 7 yards cost at 1 D 14 cts. 7 m. per. yd?

$$\begin{array}{r} \text{D. } 14 \ 55 \\ 25 \\ \hline \end{array}$$

$$\begin{array}{r} 7275 \\ 2910 \\ \hline \end{array}$$

$$\begin{array}{r} \text{D. } 1 \ 14 \ 7 \\ 7 \\ \hline \end{array}$$

Ans. 8 02 9  
D. ct. m.

Dol. 363,75ct, Ans.

Questions.

yds. D. ct, m.

1. 9 at 3 17 6 per yard,
2. 14—1 97 0 ———
3. 16—2 12 5 ———
4. 42—0 75 0 ———
5. 54—0 87 5 ———
6. 78—0 42 2 ———

Answers,

D. ct. m.

- 28 58 4
- 27 58 0
- 34 00 0
- 31 50 0
- 47 25 0
- 32 91 6

### DIVISION.

Divide as in whole numbers, and point off so many places for cents and mills as there are cents and mills in the dividend.

If there be a remainder and the dividend be not in the lowest denomination, reduce it to the next less by annexing cyphers.

E

## FEDERAL MONEY.

## EXAMPLES.

D. ct.

1. Divide 876 25 equally among 25 men.      2. Divide 8967 68 lars equally among 34 men.

D. ct.	D. ct.	D. ct.
25)876 25	(35,05 Ans. 34)	8967 (163, 1/2)
75		68
—		—
126		216
125		204
—		—
125		127
125		102
—		—
		2500

RULE OF THREE DIRECT.

*The Rule of three direct consists of three numbers given to find a fourth, which shall have the same proportion to the third, as the second has to the first.*

Two of the three given numbers are always of one name or quality, viz. money, weight, measure, &c. of which one is the demand. The other is of the same name or quality with the answer required. In stating the question, these numbers must be placed in the following order.

**RULE. 1.** That number which asks the question\* must be the third term; that which is of the same name, or quality, the first; and the other, which is of the same name or quality with the answer required, the second.

2. If the numbers have several denominations, reduce them to the lowest mentioned, and the first and third to one name.

3. Multiply the second and third numbers together, divide the product by the first, and the quotient will be the answer to the question in the same name you left the middle number, which, if in a small denomination, must be brought to the highest possible.

**OBSERVATION 1.** If the product of the second and third numbers, when multiplied together, be less than the first term, reduce the second to a less denomination.

---

\* *The number which asks the question has commonly these words before it, viz. How much? How many? What will? What cost? &c.*

## RULE OF THREE DIRECT.

2. If there be a remainder after you have divided by the first term, and the second be not reduced to its lowest denomination, then reduce the remainder to the next less denomination: and divide again by the same divisor, and so on, till nothing remains, or you have brought it to the least denomination.

PROOF. Reverse the order of the numbers; that is, make the third term the first; the first term, the third: the answer the second, and proceed as before; then if the work be right, the answer of this statement will be equal to the second term of the former statement.

## EXAMPLES.

1. If 4 acres of land cost £17, what will 12 acres cost at that rate?

acres £ acres.

As 4: 17 :: 12

12

Here the question is asked, what will 12 acres cost? 12 there-

# RULE OF THREE DIRECT.

53

4. If a family of 6 persons consume 4 bushels of grain in a month, how many bushels will serve a family of 15 persons the same time?

Ans. 10 bushels.

5. If a staff, 3 feet long, cast a shade, on level ground, 5 feet, how high is that steeple whose side at the same time measures 106 feet.

Ans.  $63\frac{1}{3}$  ft.

6. How many yards of cloth at 15s. per yard, may I have for £30?

Ans. 40 yards.

7. If 1 Cwt. of sugar cost £4 13 4, what will 6 Cwt. 2 qrs. 13 lbs. cost?

Cwt.      L   s.   d.      Cwt.   qrs.   lbs.

1      4   13   4   ::   6      2      13

4      20      4

4      93      26

18      12      28

12      1120      221

52

741

1120

1482

741

741

112)

829920(7410

784

210)5117 6

459

448      £30 17 6

112

112

112

Answer.

112

112

$$\begin{array}{r}
 54 \\
 30 \\
 \hline
 6)1620
 \end{array}$$

12) 270 = the ansr

$$2|0) 2126$$

£1 2 6d. A

9. If 16 acres of land cost £60  
9 acres cost ?

acres      £      acres.  
As 16 : 60 :: 9

$$\begin{array}{r}
 9 \\
 \hline
 16)540 \quad \text{£} \quad \text{s.} \\
 \quad \quad 33 \quad 15 \text{ Ans.}
 \end{array}$$

# RULE OF THREE DIRECT. 55

10. If 15 yards of cloth cost £ 3, what will 2 yards cost?

yds. £ yds.

Ans 15 : 3 :: 2

$$\begin{array}{r} 20 \\ \hline 60 \\ 2 \\ \hline \end{array}$$

Here I reduce the second term to shillings, because the first term cannot be contained in the product of the second and third.

15)120(8 Ans.

120 See observation 1st.

11. If 1 yard of cloth cost 4 shillings; what will 15 yards cost?

yd. s rd.

Ans 1 : 4 :: 15

$$\begin{array}{r} 4 \\ \hline 210)610 \\ \hline \end{array}$$

Here the first term being an unit. I do not divide by it, for neither multiplies nor divides;

£3 Ans. therefore the multiplying of the second and third numbers together produces the answer in shillings, which I bring into pounds, and the work is done.

12. If my salary be £109 10 per annum, what does it amount to per day? Ans. 6s.

13. If 3 yards of ribband cost 1 shilling, what will 100 yards cost? Ans. £ 13 4

14. What will 12 score of pork come to, at 4½d. per pound? Ans £ 4 10

15. Bought a box of tea containing 2 qrs. 17lb. for which I gave £29 4s; what is one pound of it worth? Ans. 8s.

16. A owes B £128. but B agrees to receive only 1s shillings on the pound; what must he receive for his debt? Ans. £ 96

What are 6 acres of it worth ?

acres £ s d ac  
As 28 : 142 16 6 : :

$$7 \times 4 = 28$$

$$7 \overline{)856190}$$

$$4 \overline{)12285}$$

$$£30 \ 12^s \ 1\frac{1}{2}d$$

19. If an acre of land be worth  
what are  $\frac{3}{4}$  of it worth ?

pts. £ s d. pts. £  
As 4 : 4 13 6 : : 3 : 3

15. If  $\frac{1}{8}$  of an acre of land c  
what is the value of the whole acre

A

*The following questions are in Fede*

20. If 12 yards of cloth cost 21

21. If an ounce of silver be worth 87 cents, what is the price of a tankard that weighs 2 lb 10 oz. 13 *parts* ?      Ans. 30D. 14½ cts.

22. Bought a farm at 14½ dollars per acre, for 522 dollars; how many acres did it contain ?      Ans. 36 acres.

23. If I spend 2D. 25cts. per week, how long will 500 dollars last me ?

Ans. 4 years 14<sup>50</sup>/<sub>25</sub> weeks.

24. What will 12 Gallons of wine come to at 37½ cents per quart ?      Ans. 18 dolls.

25. What will 1½ Cwt. of sugar come to at 9 cents per pound ?      Ans D. 15, 12

26. If a person, whose rent is 96 dollars, pay a tax of D.8, 75; how much should a person pay, whose rent is 240 dollars ?

Ans. D. 21, 87½

27 If my income be 400 dollars per year, how much may I spend per day so that I may lay up 60 dollars at the year's end ?

Ans. 93 cts. 1<sup>185</sup>/<sub>365</sub> m.

28. A merchant bought a cask of wine at 75 cents per gallon, which contained 84 gallons, 21 of which leaked out in transporting; the merchant being unwilling to lose by it, wishes to sell the remainder for what the whole cost him: can you tell how he must sell it per gallon ?      Ans. 1 dollar.

29. If a man's yearly income be 1000 dollars, and he spend 3 dollars 75 cents per day, I demand what he saves or loses per year.

Ans. loses 368D. 75 cts.

30. How many yards of cloth, at 87½ cts. per yard, may I have for 26D. 25 cents ?

Ans. 30 yards

38      RULE OF THREE DIRECT.

31. If a barrel of cider, containing 32 gallons, cost 2 dollars and 8 cents; & I sell it at 5 cents per quart, what do I gain?    Ans. 4 D. 32 cts.

32. Bought 800 lbs. of tobacco, but after it was cut and dried, it weighed but 725 lbs; what did it lose per pound?    Ans.  $1\frac{1}{2}$  ounces.

33. What will  $12\frac{1}{2}$  gross of buttons come to at 15 cents per dozen?    Ans. 22½ dollars.—

34. If my horse cost me 57 cents per week for keeping, what will be the charge of 11 horses for 1 year?    Ans. D. 326 04

*In exchanging one commodity for another, first find the value of the given quantity at the given price, then find what quantity of the other, at its given price, may be had for that money.*

35. How many bushels of rye at 87½ cents per bushel, must be given for 40 reams of paper at 3 dollars per ream?

## RULE OF THREE INVERSE. 59

### RULE OF THREE INVERSE.

*The Rule of three Inverse consists of three numbers given to find a fourth, which shall have the same proportion to the second, as the first has to the third.*

If a greater number require a greater, or a less, require a less, the question belongs to the rule of three direct.

But if a greater number require a less, or a less require a greater, it belongs to the rule of three Inverse.

**RULE. 1.** State and reduce the numbers, as in the rule of three direct.

**2.** Multiply the first and second terms together, divide their product by the third, and the quotient will be the answer.

### E X A M P L E S.

1. What number of men will it take to finish in 6 days, what 36 men would be 9 days about ?

$$\begin{array}{ccccc} \text{d.} & & \text{men} & & \text{d.} \\ \text{As } 9 & : & 36 & :: & 6 \\ & & 9 & & \end{array}$$

6) 324

Ans. 54 men.

2. What principal will gain as much in 8 months as £ 100 will in twelve months ? Ans. £ 150.

3. What length of a board, that is 8 inches wide, will make a foot square ?

Ans. 18 inches.

4. If a pasture will feed 12 horses 16 weeks; how long will it feed 48 horses ?

Ans. 4 weeks.

## FRACTIONS.

4. If I sow 20 bushels of pease, and they produce, in one year, 276 bushels; how many bushels, in 6 years, will 90 bushels produce?

Ans. 745½ bushels.

5. If 75 bushels of oats serve 50 horses 6 days, how many bushels will serve 100 horses 14 days?

Ans. 350 bushels.

6. If 100 dollars gain 6 dollars in a year what principal will gain 1 dollar in 1 day.

Ans. 6083⅓ dollars.

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 DEFINITION OF VULGAR FRACTIONS.
 

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Vulgar fractions are broken numbers or parts of a whole number, and are set down thus,  $\frac{1}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{8}$ , signifying one third, three fourths, five eighths.

The upper figure is called the numerator, and the lower, the denominator.

$\frac{5}{10}$  or  $\frac{1}{2}$ ; .25 is  $\frac{25}{100}$ , or  $\frac{1}{4}$ ; .125 is  $\frac{125}{1000}$ , or  $\frac{1}{8}$ ; but as they are always known, they are not expressed.

Cyphers after decimals are of no signification, for .500 is but .5. But cyphers before decimals decrease their value; for .5 is  $\frac{5}{10}$ , but .05 is only  $\frac{5}{100}$ .

### ADDITION OF DECIMALS.

**RULE. 1.** Place the decimals even at the left hand, and the whole numbers even at the right.

**2.** Add them together as in whole numbers, and point off so many figures, from the right hand of the sum, as are equal to the decimals in the greatest number added.

### EXAMPLES.

7 3 3 3, 6 4	1 2 3 3, 5	1 4, 5 6
6 5 4 3, 2 3	1 7 8, 9 8	2 5, 6 7 4
4 5 6 7, 8 9	7 6, 5 4 3	7, 0 5
9 8 7 6, 5 4	2, 1 2 3 4	4, 3 2 1

4. Add 12,5—44,75—632.11—1,0017.  
—44 together. Ans. 734,3847

### SUBTRACTION OF DECIMALS.

**RULE.** Place the numbers and point off the decimals, as directed in addition of decimals; and subtract as in whole numbers.

### EXAMPLES.

From	9 8 7, 6 5 3	7 6 5, 5	14,2
Take	4 5 6, 7 8 4	4 3, 2 1	,1236

## MULTIPLICATION OF DECIMALS.

**RULE. 1.** Multiply as in whole numbers, having no regard to the decimals, till the product is obtained.

2. Point off so many figures for decimals from the right hand of the product, as there are decimals in the multiplicand and multiplier. If there be not so many in the product, prefix so many cyphers to the left hand, as will make them equal.

## EXAMPLES.

Multiply 78,452	2,75	19,45
by ,12	,004	,072
<hr/>	<hr/>	<hr/>
9,41424	,01100	3890
		13615

## EXAMPLES.

$$,25)3,675 \quad (14,7 \text{ quo.} \quad ,125)12,000(576 \text{ qu.}$$

$$\begin{array}{r} 25 \\ \hline 117 \\ 100 \\ \hline 175 \\ 175 \\ \hline \end{array}$$

$$\begin{array}{r} 625 \\ \hline 950 \\ 875 \\ \hline 750 \\ 750 \\ \hline \end{array}$$

3. Divide ,0168 by ,004      Ans. 4,2.  
 4. Divide 5,4864 by ,072      Ans. 76,2.  
 5. Divide 1,9608 by 4,3      Ans. ,456.

## REDUCTION OF DECIMALS.

## CASE I.

*To reduce a vulgar fraction to a decimal.*

**RULE.** Annex cyphers to the numerator and divide by the denominator, and the quotient will be the decimal required.

**Note 1.** *The number of the figures in the decimal required must be equal to the number of cyphers annexed; if there be not so many. prefix so many cyphers to the left hand as will make them equal.*

**Note 2.** *Four or five decimal places are commonly sufficient.*

## EXAMPLES.

1. Reduce  $\frac{3}{4}$  to a decimal.      4)100

,75 Ans.

2. Reduce  $\frac{1}{25}$  to a decimal.      Ans. ,04

3. Reduce  $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{1}{6}$  and  $\frac{4}{7}$ , to decimals.

Ans. ,5, ,666 ,75, ,8, ,633, ,5316.

F 2

## C A S E II.

*To reduce money, weights, measures, &c. to decimals.*

RULE. 1. Annex cyphers to the low nomination and divide by the parts next higher denomination.

2. Place the next higher denomination before the quotient, and divide by the part next higher denomination, and so on, at last quotient will be the answer.

## E X A M P L E S.

1. Reduce  $15/9\frac{1}{2}$  to the decimal of a

$$\begin{array}{r|l} 4 & 2, 00000 \\ 12 & 9, 50000 \\ 20 & 15, 79166 \\ \hline \end{array}$$

## DECIMAL FRACTIONS.

67

### CASE III.

*To find the value of a decimal, in money, weight, measure, &c.*

**RULE. 1.** Multiply the decimal by the number of parts, contained in the next less denomination, and point off so many figures for decimals, as there are figures in the given decimal; the figures on the left hand will be whole numbers.

2. Multiply the remaining decimals by the parts of the next denomination, and point off as before; and so on through the whole, and the figures on the left hand of the point, make the answer.

### EXAMPLES.

1. What is the value of ,2 3 2 4 of a pound.  
2 0 shill. in a £

Ans. 4/7½	$\begin{array}{r} 4, 6. 480 \\ \hline 12 \\ \hline 7, 7760 \\ \hline 4 \end{array}$	d. in a shilling. qr, in a d,
-----------	---	-------------------------------------

3, 1040

2. What is the value of ,75 of a dollar?

Ans. 4/6.

3. What is the value of ,625 of a C. wt.?

Ans. 2qrs. 14lbs.

4. " What is the value of ,125 of a day?

Ans. 3 hours,

5. What is the value of ,6875 of a yard?

Ans 2/7 0 in 2 bars

6. What is the value of ,15 of a shilling.

Ans. 3d.

## SIMPLE INTEREST.

### SIMPLE INTEREST.

Interest is a premium of a certain sum allowed by the borrower, for the loan of money at a certain rate, which, by law, must not exceed 6 per cent. That is 6 dollars for the use of 100 dollars for 1 year.

*Principal* is the money lent.

*Rate* is the sum per cent.

*Amount* is the principal and interest, added together.

WHEN THE PRINCIPAL IS FEDERAL MONEY.  
C A S E I.

*To find the interest for any number of years.*

**RULE** Multiply the principal by the rate per cent and that product by the number of years ; and from the right hand of the last product, point off two more figures than there are cents and mills in the given principal. These

## SIMPLE INTEREST.

69

### C A S E II.

*To find the interest for any number of months.*

**RULE.** Find the interest for one year, and take aliquot parts.\*

Or if the rate per cent be 6, multiply the principal by half the given number of months, and the product, separated as directed in case I, will be the answer.

### E X A M P L E S.

What is the interest of \$76D, 14 cents, for 8 months at 6 per cent?

D. 876 14 ct.  
6

mo. \_\_\_\_\_

$6 = \frac{1}{2}$ ) 52, 56 8, int. for 1 yr.

$2 = \frac{1}{3}$ ) 26, 28 42 do. for 6 mo.

8, 76 14 do. for 2 mo.

35, 04 56 do for 8 mo.

D. ct. m.                  D. ct.

Or thus, 876, 14

$4 = \frac{1}{3}$  No. of mo.

D. 35, 04 56. Ans.

\* Thus, for one month, take one twelfth part of the interest for one year; for two months, take one sixth; for three months, take one fourth; for four months take one third; for five months, take one fourth and one sixth; for six months, take one half; for seven months, one third and one fourth; for eight months, two thirds; for nine months, one half and one fourth; for ten months, one half and one third; for eleven months, one half, one fourth, & one sixth.

$$\begin{array}{r} 148 \\ 37 \overline{) 548} \end{array}$$

Dol. 1,85 Ans.

*Questions at 6 per cent.*

	D.	ct.	m.		D.
3.	123	75	4 for 1 mo.	0	
4.	124	50	0 — 2 —	1	
5.	125	00	0 — 3 —	1	
6.	126	07	8 — 4 —	2	
7.	127	17	0 — 10 —	6	
8.	128	20	0 — 20 —	12	

### CASE III.

*To find the interest for d.*

**RULE.** Multiply the principal by that product by the given number divide by 365, and the quotient, separated in pounds, shillings, pence, and farthings, is the interest.

## SIMPLE INTEREST.

71

This method is founded upon the principle that 60 days are 2 months; but as it falls a little short of a sixth part of a year, the interest will consequently be a trifle too much; therefore if the sums are large, the interest ought to be computed by the former method.

### E X A M P L E S.

1. What is the interest of 27 D. 17c. 4m. for 12 days at 6 per cent?

$$\begin{array}{r} \text{D. } 27 \ 17 \ 4 \\ \quad \quad \quad 12 \\ \hline \end{array}$$

$$\underline{6 \ 0 \ 326 \ 08(8)}$$

Cents 5,4134 Ans.

2. What is the interest of 156 dollars for 9 days at 6 per cent?

$$156 \times 6 \times 9 = 8424 \div$$

$$365 = 23 \text{ cents. Ans.}$$

3. What is the interest of D. 20,15 $\frac{1}{2}$  for 7 days, at 6 per cent?

Ans. 2 cts. 3 m.

4. What is the interest of D. 34,75 for 10 days, at 6 per cent?

Ans. 5 cts. 7 m.

5. What is the interest of 36 dollars for 25 days, at 6 per cent?

Ans. 13 cents.

7. What is the interest of D. 6083 $\frac{1}{2}$  for 2 days, at 6 per cent?

Ans. 1 dollar.

What is the interest of 150 dollars for 12 days, at 5 per cent?

Ans. 37 cts. nearly

## SIMPLE INTEREST.

## C A S E IV.

*To find the interest for days, or months and days, when the rate is 6 per cent.*

## R U L E.

Find half of the greatest even number of months, and to the right hand of which, set a sixth part of the number of days, separated from the months by a comma; by which multiply the given principal; and from the right hand of the product, point off two more figures, than there are figures in the sixth part of the days, and the cents and mills in the principal counted together; those figures to the left of the point will be dollars, and those to the right, cents, mills, &c.

Note. 1. When there is an odd month, it must be accounted 30 days, and added with the given days.

# SIMPLE INTEREST.

73

2. What is the interest of D.567,25 cts. for 6 months and 18 days? D. cts. m.

Ans. 18 71 9.

3. What is the interest of 675 dollars for 5 months and 6 days? Ans. D.17,55.

4. What is the interest of 787 dollars for 9 months and 21 days?

M. d. M. d.

9 21=8 . 51

Then  $\frac{1}{2}$ ) 9 510

4,85

D. 7 8 7  
4,85

3 9 3 5  
6 2 9 6  
3 1 4 8.

Ans. 18, 16 915

D. cts. m.

5. What is the interest of D876,48 cts. for 14 months and 5 days? Ans. D.62,054.

6. What is the interest of 156 dollars for 2 months and 15 days?

Ans. D.1,95 cts.

7. What is the interest of 1000 dollars for 1 month and 13 days?

Ans. D.7,16 cts.

8. What is the interest of 68 dollars for 7 months and 20 days?

Ans. D2,606.

9. What is the interest of D.333,67 cts. for 9 days?

Ans. 50 cents.

G

## COMPOUND INTEREST.

*Compound Interest is what arises from the principal and interest, taken together, as it becomes due.*

**RULE. 1.** Multiply the given principal by the rate per cent, setting the product two places to the right hand of the principal.

2. Add the product and principal together in the same order in which they stand, and the sum will be the amount for the first year, and the principal for the second; with which proceed as before, and so on, thro' all the payments to the last.

3. Subtract the given principal from the last amount, and the remainder will be the compound interest required.

## EXAMPLES.

1. What is the compound interest of 450D. 57 cts. for 3 years at 6 per cent?

## COMPOUND INTEREST.

75

2. What is the compound interest of 500 dollars, for 4 years, at 6 per cent?

Ans. 131 D. 23 cts. 8m.

3. What is the compound interest of 480 dollars, for 5 years, at 6 per cent?

Ans. 162 Dols. 34cts 8m.

THE most concise method to calculate compound interest is to multiply the given principal by the amount of one dollar for the given rate and time, according to the following

### T A B L E,

Shewing the amount of one dollar at compound interest for any number of years, under 12\* at 6 per cent.

<i>years.</i>	<i>amount of one dollar.</i>	<i>years.</i>	<i>amount of one dollar.</i>
1	1,06	7	1,50363
2	1,1236	8	1,593818
3	1,191016	9	1,689478
4	1,262476	10	1,790847
5	1,338225	11	1,898298
6	1,418519		

### EXPLANATION OF THE TABLE.

The amount of 1 dollar for 1 year at 6 per cent is D.1,06; this multiplied by 1,06=1,1236, the amount of the second year; this multiplied by 1,06 is 1,191016, the amount of the third year, &c. And thus for any other per cent.

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\* Any sum, at 6 per cent, compound interest will double in 11 years 325 days.

## COMMISSION.

### USE OF THE TABLE.

When any sum is given for any number of years, multiply the given sum by that number which answers to the number of years, and the product, pointed as directed in multiplication of cimals, will shew the amount for that time. The given principal subtracted from the amount will leave the compound interest.

What is the amount of 480 dollars, for four years, at 6 per cent, compound interest?

Ans. D. 605,988.

What is the compound interest of 1000 dollars for 10 years, at 6 per cent?

Ans. 790 D. 84 cts. 7m.

## COMMISSION.

... is a premium, allowed to a person, at ... or selling goods for

**DISCOUNT.**

*Discount is an abatement of so much on a debt, to be paid before it becomes due, that the remainder, being put out at interest for the same time and rate, will amount to the sum then due.*

**RULE.** As the amount of a 100 dollars, or pounds, for the given rate and time, is to the interest of a 100 dollars or pounds, for the same rate and time; so is the given sum to the discount required.

Subtract the discount from the given sum, and the remainder will be the present payment.

### EXAMPLES.

1. What is the discount and present payment of 467 dollars, due 18 months hence, at 6 per cent?

D. D. D. D. ct. m.  
 100 As 109 : 9 : : 467 : 38, 55, 9  
 6  
 mo. — D. ct. m.  
 6 is  $\frac{1}{2}$  600 From 467 00 0 given sum.  
 300 take 38 15 0 discount.

D. 9, 000. leaves 428 44 i pref. paymt.

2. What is the discount of 1000 dollars due 9 months hence, at 5 per cent?

Ans. 36D. 14cts. 4m.

3. What ready money will discharge a debt of 444 dollars, due 15 months hence, at 6 per cent?      Ans. 413D. 02cts. 4m.

Ans. 4' 3 D. 02cts. 4m.

4. What is the discount of £75 16s. due 3 years hence, at 6 per cent?

Ans. £11 11s 3d.

*It likewise teaches how to divide  
estate among his creditors, when the  
equality of property.*

# SINGLE FELLOWSHIP

*Single Fellowship is when the stocks are  
for an equal time.*

**RULE.** Add all the particular stocks  
together; then as the sum of  
stock is to the gain or loss; so is each  
particular stock to his particular share  
of gain or loss.

**PROOF.** Add all the shares together;  
their sum will be equal to the whole  
gain, when the work is right,

## EXAMPLES.

1. Two men traded in partnership;  
A. 300 dollars, and B. 500 dollars  
gained 400 dollars; what is each man's  
share of the gain?

300 A's stock.	As 800 :
500 B's stock.	
<hr/> 800 whole stock	<hr/> 800 ) :

## DOUBLE FELLOWSHIP.

79

2. Two men traded in company ; A put in 320 dollars, B put in 450 dollars, and they gained 260 dollars ; what is each man's share of the gain ?

320 A's stock.

450 B's stock.

770 whole stock,

D. ct.  $\frac{15}{100}$

As 770 : 260 :: 320 : 108  $\frac{05}{77}$  A's

As 770 : 260 :: 450 : 151  $\frac{94}{77}$  B's

3. Three men traded in partnership. A put in 150 dollars, B, 260, and C, 370, and they gained 390 D. what is each man's part of the gain ?

Dols. 75 A's gain

130 B's —

185 C's —

} Answer.

4. A bankrupt is indebted to A 40 dols. 25 cents ; to B 75 dols. 50 cts. ; to C 27 dols. 75 cts. ; and to D. 85 dols, and his estate is worth but 45 dols. 70 cts. ; what must each man receive in proportion to his debt ?

Dols. cts.

A must receive 8 05

B — — — 15 19

C — — — 5 55

D — — — 17 00

} Answer.

## DOUBLE FELLOWSHIP.

*Double Fellowship is when the different stocks are employed for different times.*

**RULE. 1.** Multiply each man's stock by the time it is employed.

## DOUBLE FELLOWSHIP.

2. As the sum of the products, thus found, to the whole gain or loss, so is the product of each man's stock with its time, to his particular share of the gain or loss.

### E X A M P L E S.

1. Three men hired a pasture for 60 dollars per year; A put in 20 sheep for 4 months, B put in 30 sheep for 6 months; and C put in 40 sheep for 7 months; how much must each man pay of the rent?

$$20 \times 4 = 80 \text{ A's stock with its time.}$$

$$30 \times 6 = 180 \text{ B's stock with its time.}$$

$$40 \times 7 = 280 \text{ C's stock with its time.}$$

540 sum of the products.

$$\text{As } 540 : 60 :: 80 : 8, 88 \frac{4}{5} \text{ A's share.}$$

$$\text{As } 540 : 60 :: 180 : 20, 00 \text{ B's share.}$$

$$\text{As } 540 : 60 :: 280 : 31, 11 \frac{1}{3} \text{ C's share.}$$

4. Two men traded in company ; A put in at first, five hundred dollars, and at the end of 6 months, he put in 100 more ; B put in at first 750 dollars, and at the end of 9 months, he took out 250 ; at the end of 18 months, they find they have gained 420 dollars ; how much is each man's share ?

*First*,  $500 \times 6 = 3000$  product of A's first stock with its time ; &  $100 + 500 = 700$  and  $700 \times 12 = 8400$  product of A's increased stock with the remainder of the time ; therefore  $3000 + 8400 = 11400$  product of A's whole stock with the whole time.

*Secondly*,  $750 \times 9 = 6750$  product of B's first stock with its time ; and  $750 - 250 = 500$ , and  $500 \times 9 = 4500$  product of B's remaining stock with the remaining time ; therefore  $4500 + 6750 = 11250$  product of B's stock with the whole time.

$11400 + 11250 = 22650$  ; then,  
As 22650 : 420 : : 11400 : 211, 39  $\frac{16}{25}$  A's  
As 22650 : 420 : : 11250 : 208, 60  $\frac{2100}{25}$  B's.

## LOSS AND GAIN.

*Loss and gain is a rule, by which merchants discover the profit or loss per cent, and it likewise instructs, them to fix the price of their goods, so as to gain or lose so much per cent.*

### CASE I.

*To know what is gained or lost per cent.*

**RULE.** As the price it cost is to the gain or loss, so is 100 dollars to the gain or loss per cent.

## LOSS AND GAIN.

## EXAMPLES.

1. If I buy tea at 60 cents per pound, and sell it for 70 cents per pound, what do I gain per cent, or in laying out 100 dollars?

D. cts. D. D. cts.

As 60 : 10 :: 100 : 16, 66 Ans.

2. If a piece of cloth, containing 42 yards, cost 14 dollars, and is sold for 37½ cents per yard, what is gained or lost per cent?

yd. cts. yds. D. cts.

As 1 : 37½ :: 42 : 15, 75 fold for.  
14

1,75 gained in  
the whole.

D. D. cts. D. D.

As 14 : 1,75 :: 100 : 12½ per cent. Ans.

At 12½ cents in the dollar profit how much

## CROSS MULTIPLICATION.

83

### E X A M P L E S.

1. If a gallon of brandy cost 1D. 30 cents, how must it be sold to lose 12 per cent?

D. D. cts.    D.    D. cts. m.

As 100 : 1, 30 : : 88 : 1, 14, 4    Ans.

2. If 1 yard of cloth cost 2 dollars, how must it be sold to gain 8 per cent?

As 100 : 2 : : 108 : 2dol. 16cts. per yd.    Ans.

3. How must I sell land that cost 2 dollars per acre, to gain 50 per cent?    Ans. 3 dols.

4. How must sugar be sold per pound, that cost 9 dollars per C. wt. to gain 12½ per cent?    Ans. 9 cents.

## CROSS MULTIPLICATION

*Is a rule made use of in casting up the contents of wood, boards, &c. the dimensions of which are taken in feet, inches, and parts.*

Inches and parts are sometimes called primes, seconds, thirds, &c. and are marked thus, primes (') seconds ("), thirds ('''); 12 of each denomination make one of the next greater.

### GENERAL RULE.

Inches multiplied by inches produce seconds; inches multiplied by feet, or feet by inches, produce inches; and feet multiplied by feet, produce feet.

### E X A M P L E S.

	Feet		
1. Multiply	16	4'	
by	7	8	
	-----		
	10	10	8"
	114	4	
	-----		
	125	2	8"

$$\begin{array}{r} 10 \quad 11 \quad 3'' \\ 56 \quad 3 \end{array}$$

Feet 67    2'    3"    *Ans.*

3. How many feet in a board long, and 4 inches wide ?

4. How many feet in a board long and 1 foot 9 inches wide

*NOTE. When one end of a board is wider than the other, add the dimensions of both ends and take half for a mean breadth.*

5. How many feet in a board wide at one end, 1 foot 10 inches and 11 feet 4 inches long ?

*Feet.*

$$\begin{array}{r} 2 \quad 4' \\ 1 \quad 10 \end{array}$$

$$\frac{1}{2}) 4 \quad 2$$

# CROSS MULTIPLICATION. 85

## OF MEASURING WOOD.

**NOTE.** It takes 16 solid feet to make 1 foot of wood or bark, and 8 of these feet to make 1 cord; Therefore,

After multiplying the length by the width and that product by the height; divide the last product by 16, and the quotient will be the answer in feet, which divided by 8, will be cords.

### EXAMPLES.

1. How many feet in a load of wood, 7 feet 6 inches long, 3 feet 7 inches wide, and 3 feet 9 inches high?

$$\begin{array}{r}
 F. \\
 7 \text{ } 6' \\
 3 \text{ } 7 \\
 \hline
 4 \text{ } 4 \text{ } 6^* \\
 22 \text{ } 6 \\
 \hline
 26 \text{ } 10 \\
 3 \text{ } 9 \\
 \hline
 20 \text{ } 1 \\
 80 \text{ } 6
 \end{array}$$

\* Seconds are of so little consequence, that they may be rejected.

$$\begin{array}{r}
 F. \\
 16 \overline{) 1007} \quad (6 \text{ } 3' \text{ } \frac{1}{2} \text{ or 6 feet and a quarter.} \\
 \underline{96} \qquad \qquad \qquad \text{Answer.} \\
 47 \\
 \underline{32} \\
 15 \\
 16 \overline{) 55} \text{ } (3 \\
 \underline{48} \\
 7
 \end{array}$$

H

3 feet 9 inches high ?

Note, when the wood is 8 feet in length, multiply the height by the width, and half the result is the answer.

4. What is the content of a load of 3 feet long, 3 feet 6 inches wide, and 3 feet 9 inches high ?

$$\begin{array}{r} 3 \ 9 \\ 3 \ 6 \\ \hline 11 \ 10 \\ 11 \ 3 \\ \hline \end{array}$$

$$\frac{1}{2}) \ 13 \ 1$$

F. 6' 6" Ans.

5. What is the content of a load of 3 feet long, 4 feet 3 inches wide, and 3 feet 9 inches high ?

Ans. 6'

6. What is the content of a load of 3 feet long, 3 feet 6 inches wide at one end, 3 feet 4 inches at the other, and 3 feet 9 inches high ?

Ans. 6 feet

GAUGING.

of the diameter by the depth, and divide by 359 for beer gallons, and 294 for wine.

*E X A M P L E.*

What is the content, in beer and wine gallons, of a tub, 50 inches diameter and 40 inches deep?

50

50

---

2500 *square of the diamet. r.*

40

---

100000 ÷ 359 = 278 Gall. 2 qt. for beer.

100000 ÷ 294 = 340 Gall. for wine.

*To gauge or tell the content of a square cistern, in gallons, or bushels.*

**RULE.** Multiply the length, breadth, and depth together, and divide by 282 for beer gallons, 231 for wine, and 2150 for bushels.

*E X A M P L E.*

What is the content in gallons and bushels, of a cistern in the form of a long square, whose length is 57 inches, breadth 42 inches, depth 34 inches?

$57 \times 42 \times 34 = 81396$  *cubic inches.*

$81396 \div 282 = 288.63$  *beer gallons*

$81396 \div 231 = 352.363$  *wine gallons.*

and  $81396 \div 2150 = 37.85$  *bushels.*

*To gauge a cask.*

**RULE.** To the double square of the bung diameter, add the square of the head diameter, multiply this sum by the length of the cask, and divide by 1077 for beer, or 882 for wine.

## 38 MISCELLANEOUS QUESTIONS.

### EXAMPLE.

What is the content, in beer and wine gallons, of a cask, whose bung diameter is 28 inches, head diameter 25 inches, length 36 inches?

*The square of the bung diameter 28 is 784; which doubled is 1568. The square of the head diameter 25 is 625, which added to 1568 is 2193; this multiplied by 36, the length, is 78948 which divided by 1077 = 73 gallons, 1 quart, for beer; and divided by 882 = 89½ gallons, wine or brandy.*

### MISCELLANEOUS QUESTIONS.

1. What is the value of  $1\frac{1}{2}$  C. wt. of coffee, at  $5\frac{1}{2}$  pence per ounce?

Ans £. 6s 12s.

2. If two men in three days, earn 2 D. 50 cts.

## MISCELLANEOUS QUESTIONS. 89

7. A Gentleman gave his son and daughter 10,000 dollars, but the son's portion was 19 times as much as the daughter's; what was the portion of each?

Ans. the son's 9500 D. daughter's 500 D.

8. How many strokes will a regular clock strike in a year?

Ans. 56940

9. Divide 144 dollars among a man, a woman, and a boy, so that the man will have three times as much as the woman, and the woman twice as much as the boy.

Ans. The man's 96 D. the woman's 32, and the boy's 16.

10. A Gentleman lent 400 dollars to receive interest for the same, and at the end of two years he received for principal and interest 440 dollars, what was the rate per cent?

Ans. 5.

11. A hound runs 25 rods while a hare runs 23; now if the hare be 50 rods before the hound how many rods will the hound run before he overtakes the hare?

Ans. 625 rods.

12. If 12 apples are worth 21 pears, and 3 pears cost a half penny, what will be the price of four score and four apples?

Ans. 2/0½

13. What number multiplied by 46 will produce just what 391 multiplied by 8 will do?

Ans. 68.

14. A maid, carrying apples to market, was met by three boys, the first took half of what she had, but returned ten; the second took one third, but returned 2; the third took half of what she had left and returned 1; and upon

90 METHOD OF ASSESSING TAXES.

examination she found she had 12 apples left ; how many had she at first ?      Ans. 40.

15. If 6 $\frac{1}{2}$  lb of sugar be equal in value to 7 lb. of raisins, 5 lb of raisins to 2 lb of almonds, 3 lb of almond to 5 lb of currants, 2 lb. of currants to 18 pence ; what is the value of 3 lb. of sugar ?

Ans. 21d.

16. Edmond told his sister Charlotte, whose father had left them 12 thousand 12 hundred pounds apiece, that their Grandmother had raised her fortune to 15 thousand pounds, and had made his own 10 thousand ; pray what did the old lady give them ?      Ans. £. 8600.

17. A person said he had 10 children, and there was a year and a half between each of their ages, his eldest was born when he was 24 years old, and the age of the youngest is 21 ; what was the father's age ?

## METHOD OF ASSESSING TAXES. 91

poll must pay of said tax. And by an act, passed February 20, 1806,

"All County, town, district, precinct, plantation, and parish taxes shall be assessed and apportioned by the assessors of the several towns, districts, precincts, plantations, and parishes within this Commonwealth upon the polls of, and estates within the same, according to the rules that shall from time to time be prescribed and set, in and by the then last tax act of the General Court."

*Statute Laws, Vol. 1, p. 279.*

The first thing necessary for the making of taxes is to take an inventory or valuation of the real and personal estate, and the number of polls for which each person is rateable. Then deduct the sum which the polls pay from the sum to be assessed, and then find what one dollar will pay of the remainder, by making the amount of the town's valuation the first term; the sum to be assessed, the second; and one dollar the third; and the quotient will shew what one dollar must pay. Make a table by multiplying the sum on the dollar by 2, 3, 4, &c. as follows,

D.	cts.	D.	cts.
If 1 pays	06	10	— 1, 06
Then 2	— 12	20	— 1, 20
3	— 18	30	— 1, 30
4	— 24	40	— 2, 40
5	— 30	50	— 3, 00
6	— 36	60	— 3, 60
7	— 42	70	— 4, 20
8	— 48	80	— 4, 80
9	— 54	90	— 5, 40 &c.

- 275,400 dollars : what must A's  
estate be 97 dollars, personal, 5  
who has two polls?

# O P E R A T I O N

If one poll be 27 cents, 531 pol  
dollars and 37 cents, which, bei  
from 581 dollars, will leave 437 at

A's real estate being 97 dollars,  
table that 90 dollars is - - -  
that 7 dollars is - . . .

In like manner, I find his persona  
D. 3,24 cents.

His real estate then must be taxed

His personal estate - - -

Two polls - - -

In the whole - - -  
Which should be set down in the  
follows :

---

## METHOD OF ASSESSING TAXES. 93

### EXAMPLE.

If a tax of 581 dollars require 27 cents on the poll, what will a tax of 1528 dollars require on the poll?

D. cts.      D. cts.

As 581 : 27 :: 1528 : 71 Ans.

To find what a poll must pay in parish taxes ; first, find what proportion of the state tax the parish pays ; which may be found by the town and parish valuation, by making the town valuation the first term : the town's proportion of the state tax the second ; and the parish valuation the third ; and the quotient will be the proportion of the state tax which the parish pays. Then say, as their proportion of the state tax is to the poll tax, as set by the general court, so is the parish tax to the poll tax required.

### EXAMPLE.

Suppose the valuation of a certain town be 275460 dollars ; the parish valuation be 91820 dollars ; and the town's part of the state tax be 581 dollars, paying 27 cents on the poll ; what must the parish pay on the poll in assessing 300 dollars ?

T. val.    S. tax.    P. val.    D. cts.

As 275460 : 581 :: 91820 : 193,66 the parish's proportion of the state tax.

D. cts.    cts.    D. cts.    m.

Then as 193,66 : 27 :: 300 : 41, 8 the poll tax required.

*Commitment of a tax bill*

To P. H. Collector of Taxes

The following is a list of the polls and estates of the named, each one his proportion, being the amount ed in            pages, which to you to collect; and you pay the same unto J. S. treasurer or before the            day of            you are to pay unto the            mentioned as follows. viz.

To T. D. Esq. treasurer of the Commonwealth of Massachusetts, of said office, the sum of

To S. A. treasurer of the            his successor the sum of

To J. S. treasurer of said            successor, the sum of

And you are to complete account of your collection aforesaid. on or before the

## FORMS.

### *Commitment of a Highway Tax to a Surveyor of Highways.*

To E. L. one of the Surveyors of Highways and Townways in the town of S.

*Greeting.*

The following is a list of assessments made upon the polls and estates of the persons hereafter named, each on his respective proportion of the sum of \_\_\_\_\_, being the amount of said list, which you are to cause to be expended in labour and materials upon the highways and townways within your limits, according to law, and agreeably to a vote of the said town, passed at their last annual meeting, allowing [*here insert the rates and prices affixed by the town to labour, oxen, horses, cart and plough.*] And you are to cause the whole of the said sums to be expended as aforesaid, on or before the \_\_\_\_\_ day of \_\_\_\_\_ next; and if any of the said persons shall be deficient in working out, or otherwise paying the sum in which they are assessed, you are, at the end of said term, to render to us, or our successors, a list of such persons, that such deficient sums may be put in the next assessment for a town tax, as the law directs.

*Given under our hands this \_\_\_\_\_ day of \_\_\_\_\_ A. D. 18.*

J. G. }  
R. B. } Assessors of said town.  
A. R. }

### *Warrant for the Gathering and Collecting of the State Rates, or Assessments.*

W———st. To P. H. Constable or Collector of the town of S. in the county of W.

*Greeting.*

In the name of the commonwealth of Massa-

of a tax of attachment of  
and , grant  
on by the general court of sa  
at their session begun and hol  
day of , for defi  
ry charges of securing, prote  
ing the same : and you are to  
in the same unto ,  
ceiver-general of this common  
successor in that office, and  
make up an account of your  
whole sum, on or before the  
and if any person shall refuse  
the sum he is assessed in the sai  
the goods or chattels of suc  
value thereof, and the distress  
for the space of four days, at th  
of the owner ; and if he shall  
so assessed within the said four  
are to sell at public vendue the  
for the payment thereof, wi  
giving forty eight hours notice  
posting up advertisements there

or implements necessary for his trade or occupation, beasts of the plough necessary for the cultivation of his improved lands, arms, utensils for house-keeping necessary for upholding life, bedding and apparel necessary for himself and family) for the space of twelve days, you are to take the body of such person so refusing or neglecting, and him commit unto the common gaol of the county, there to remain until he pay the same or such part thereof as shall not be abated by the assessors for the time being, or the court of general sessions of the peace for the said county.

*Given under our hands and seals, by virtue of a warrant from the treasurer aforesaid, this*  
*day of*                      , 18

J. G. }  
 R. B. } Assessors.  
 — A. R. }

*Certificate of the Assessment of a State tax to the  
 Treasurer or Receiver-General.*

PURSUANT to a warrant from the treasurer of the commonwealth of Massachusetts, dated the      day of      , Anno Domini      , we have assessed the polls and estates of the      of the sum of      , and have committed lists thereof unto the      of said      , viz, to      , with warrants in due form of law, for collecting and paying in the same unto treasurer of said commonwealth, or his successor in said office, on or before the      day of      next ensuing.

*In witness whereof we have hereunto set our hands, at      this      day of      , A. D. 18*

J. G. }  
 R. B. } Assessors.  
 A. R. }

15 yards of dimity, at	80 pe
12 lbs. coffee, at	30 pe
7 lbs. of bohea tea, at	70 pe
12 lbs. of loaf sugar, at	40 pe

Received payment in full. MOSE

*Of a Promissory Note.*

Boston, Ju

For value received, I promise to  
or order, twenty dollars on deman  
terest till paid.

*Another.*

Boston. Jul

For value received, I promise to  
or order, the sum of \_\_\_\_\_ in  
after date, with interest till paid.

*Another.*

For value received, Worcester,  
I promise to pay E. B. or order  
\_\_\_\_\_ in sixty days, (or on a  
interest till paid. Witness my ha

*An acquittance for debt, received of a third hand.*

Sutton, July 3, 1809.

Received of Mr. U. R. by the hands of S. F. the sum of ten dollars in full for \_\_\_\_\_ and of all demands. J. G.

*An acquittance for money received in part of a greater sum.*

Received this \_\_\_\_\_ day of \_\_\_\_\_ of Mr. S. F. the sum of sixty dollars, in part of a greater sum, due to me from the said S. F. G. U.

*To be given when an account is balanced by a note.*

Received of Mr. D. E. a promissory note for the sum of thirty dollars, payable to me or order, in nine months after date, which sum, when paid, is in full of all demands to this 3d. day of July 1809. I say received by me O. N.

—————○—————  
*A Due Bill for goods.*

Sutton, July 6, 1809.

Due to O. Y, or bearer, seventeen dollars in goods, on demand. E. S.

—————○—————  
*Order.*

Sutton, July 7, 1809.

Messrs. F. & Co. Please to pay C. D. five dollars in goods at cash price, and charge the same to me; it being for value received.

G. B.

910043

himself, as an apprenuce to R. P. w  
the art, trade, or myflery of——  
faid C. D. after the manner of an app  
dwell with and ferve the faid R. P.—  
the day of the date hereof, until the  
of——which will be in the year of  
one thoufand eight hundred and—  
which time the faid apprentice, if he  
living, will be twenty one years of age  
all which time or term. the faid app  
faid matter well and faithfully fhall  
fecrets keep, and his lawful comma  
where at all times readily obey: he  
damage to his faid mafter, nor wilfully  
to be done by others; and if any to  
edge be intended, he fhall give his  
fonable notice thereof. He fhall not  
goods of his faid mafter nor lend the  
fully to any: at cards, dice, or any  
lawful game he fhall not play; for  
fhall not commit, nor matrimony co  
ring the faid term; taverns, ale-hou  
ces of gaming, he fhall not haunt or

instruct the said apprentice, or cause him to be taught and instructed, in the art, trade or calling of a———by the best way or means he can, and also to teach and instruct the said apprentice, or cause him to be taught and instructed, to read and write, and cypher as far as the rule of three, if the said apprentice be capable to learn; and shall well and faithfully find and provide for the said apprentice, good and sufficient meat, drink, cloathing, lodging, and other necessaries fit and convenient for such an apprentice, during the term aforesaid, and at the expiration thereof, shall give unto the said apprentice, two suits of wearing apparel, one suitable for the LORD's days, and the other for working days.

In testimony whereof, the said parties have hereunto interchangeably set their hands and seals, the———day of———in the year of our LORD, one thousand eight hundred and

Signed, Sealed and delivered }  
in presence of us, }

(Seal)

(Seal)

(Seal)

—○—  
No deed, or other conveyance of any lands, tenements, or hereditaments, lying within this commonwealth; or any lease for more than seven years, shall be good and effectual in law against any other person or persons, but the grantor, or grantors, unless they are acknowledged by such grantor, or grantors, before some justice of the peace, and recorded at length in the registry of deeds in the county where such lands, tenements, or hereditaments do lie.

tioned, hath demised, granted, —  
letten, and doth hereby demise. gra  
farm let unto said E. F. his heirs,  
administrators and assigns [*Here  
premises*] with all the privileges an  
nances thereunto belonging.

To have and to hold the said de  
mises with their appurtenances for  
the term of ——— years from the  
of ——— fully to be complete and

And the said E. F. for himself,  
executors and administrators, doth  
and agree to pay, &c, also, &c. [*by  
particulars of the agreement on the  
lessee.*]

And the parties aforesaid for the  
spectively, each with the other and t  
tive heirs, executors and administrat  
ther covenant and agree as follows  
the said C. D. &c. and that the  
shall &c. [*as the agreement may be.*]

In witness whereof they have her

## FORMS.

103

### AGREEMENT.

ARTICLES of agreement indented, made, and concluded by and between A. B. of  
- on one part ; and C. D. of on the other part.

WHEREAS the said C. D. for the consideration hereunder mentioned doth covenant and agree to and with the said A. B. his executors, administrators, and assigns. to serve, abide, and continue with the said A. B. for the space of from the day of one thousand eight hundred, and and that he will diligently and faithfully, according to the best of his power and skill, employ himself in, and perform all such service and business whatsoever, relating to the trade of a as the said A. B. shall from time to time order and direct ; and shall and will keep the secrets of the said A. B. relating to said trade and business.

And the said A. B. on his part, for the consideration aforesaid, doth, for himself, his executors, and administrators, covenant and agree to and with the said C. D. by these presents, that he the said A. B. shall and will find and provide good and sufficient meat, drink, washing and lodging, and well and truly pay or cause to be paid unto the said C. D. his executors, administrators, or assigns the sum of

In witness whereof they have hereunto interchangeably set their hands and seals. the day of one thousand eight hundred and

Signed, sealed and delivered } (Seal)  
in presence of us, } (Seal)

do hereby give, grant, bargain, sell and convey  
unto the said C. D. his heirs and assigns to  
[Here insert the premises.] To have and to  
the said granted and bargained premises  
the privileges and appurtenances there  
him the said C. D. his heirs and assigns for  
to his and their use and behoof for ever.  
And I the said A. B. for myself my heirs  
executors and administrators, do covenant  
the said C. D. his heirs and assigns that I a  
fully seized in fee of the premises, that I  
free of all incumbrances; that I have good  
to sell and convey the same to the said  
to hold as aforefaid: and that I will  
and defend the same to the said C. D. hi  
and assigns forever, against the lawful  
and demands of all persons.

In witness whereof I have hereunto  
hand and seal, the                      day of  
thousand eight hundred and

*Signed, sealed and delivered }*  
*in presence of us, }*

# TABLE.

105

*A TABLE shewing the value of shillings, pence, and farthings, in dollars, cents, and mills.*

d.	qr.	ct.	m.	s.	d.	ct.	m.
	1		3		.8	11	1
	2		7		9	12	5
	3	1	—		10	13	9
1		1	4		11	15	3
2		2	8	1		16	7
3		4	2	2		33	3
4		5	6	3		50	—
5		7	—	4		66	7
6		8	3	5		83	3
7		9	7				

## RULES FOR REDUCING OLD LAWFUL TO FEDERAL MONEY.

*To reduce pounds to dollars, cents and mills.*

Annex four cyphers to the pounds, and divide by 3 ; the right hand figure of the quotient will be mills, the two next will be cents, and the rest will be dollars.

*E X A M P L E.*

Reduce £.76 to dollars, cents, &c.

3)760000

253.33,3 Ans.

D. ct. m.

*To reduce shillings to dollars, cents, and mills.*

Annex three cyphers to the shillings, and divide by 6 ; the right hand figure of the quotient

vide by 72 ; the right hand  
tient will be mills, and the r

### PARTICULAR

*To measure a field or piece,  
square, or whose opposite,*

**RULE.** Take the dime  
multiply the length by the b  
the product by 160 ; and t  
acres.

### E X A M P L

How many acres are there  
length is 35 rods, and breadt  
 $35 \times 24 = 840$  ; and  $840 \div 16$

*The diameter of a circle being  
circumference*

**RULE.** As 7 is to 22 ; o  
113 is to 355 ; so is the dian  
the circumference.

*The circumference of a circle  
the diameter*

**RULE.** As 22 is to 7 : or

How many solid feet in a grindstone 42 inches diameter, 132 inches in circumference, and 9 inches thick?

*Half the diameter 42 is 21; and half the circumference 132 is 66. Therefore  $21 \times 66 \times 9 = 12474$  the solid inches; and  $12474 \div 1728 = 7$  solid feet, and 378 solid inches over.*

*To measure a sphere or globe.*

Multiply the cube\* of the diameter by .5236 and the product will be the solid content.

**E X A M P L E.**

The diameter of a globe is 2.5 feet; what is the solid content?

Ans. 8,18125 feet.

A Mechanic would make a windlass in such a manner as that 1lb. applied to the wheel should be equal to 10lbs. suspended from the axle: Now supposing the axle to be 6 inches diameter, what is the diameter of the wheel?

*lb. in. lb. in.*

As 10 : 6 :: 1 : 60 *inversely, the answer.*

	<i>pts. grs.</i>
The standard weight of an eagle is	11 4 $\frac{1}{2}$
A dollar - - - - -	17 1 $\frac{1}{2}$
A dime - - - - -	1 16 $\frac{9}{10}$

One penny wt. of English and Portuguese gold is 89 cents.

One penny wt. of Spanish gold is 87 cts. 6 mills.

---

\* The cube of a number is the product of it multiplied into itself three times; thus,  $3 \times 3 \times 3 = 27$ , cube of 3.

———— Multiplication	-	-	-
———— Division	-	-	-
Compound Addition	-	-	-
———— Subtraction	-	-	-
———— Multiplication	-	-	-
———— Division	-	-	-
Reduction	-	-	-
Federal Money	-	-	-
Rule of three direct	-	-	-
———— inverse	-	-	-
Compound proportion	-	-	-
Definition of Vulgar Fractions	-	-	-
Decimal Fractions	-	-	-
Simple Interest	-	-	-
Compound Interest	-	-	-
Commission	-	-	-
Discount	-	-	-
Single Fellowship	-	-	-
Double Fellowship	-	-	-
Loss and Gain	-	-	-
Cross Multiplication	-	-	-
Gauging	-	-	-
<b>V</b> Miscellaneous Questions	-	-	-









LIBRARY  
MENT

Cumstances to  
Building

